WELLS HARBOR

WELLS , MAINE

SURVEY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
BOSTON, MASS.

SEPTEMBER 19, 1957

ARMY - NED - BOSTON

407-389

/SURVEY

WELLS HARBOR

WELLS, MAINE/

SYLLABUS

The Division Engineer finds that prospective benefits are sufficient to warrant improvement of Wells Harbor, Wells, Maine. He recommends modification of the existing project to provide for construction of two sand-tight stone jetties, 520 and 560 feet long at the harbor entrance, dredging an entrance channel 100 feet wide and 8 feet deep, an anchorage of 7.4 acres, and an inner channel 100 feet wide, both 6 feet deep and terminating behind the north end of Wells Beach. The estimated first cost of construction is $469,000 exclusive of navigation aids, estimated at $1,000 and a public landing and attendant facilities to be provided by local interests at an estimated cost of $25,000. The recommendation is made subject to certain conditions of local cooperation which include a local cash contribution of 46 percent of the cost of the jetties, channels and anchorage estimated at present to be $216,000. The cost of the work to be borne by the United States is estimated to be $253,000 with $5,450 annually for maintenance exclusive of aids to navigation.

TABLE OF CONTENTS

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
150 Causeway Street
Boston 14, Mass.

NEDGW 19 September 1957

SUBJECT: Survey of Wells Harbor, Maine

TO: Chief of Engineers, Department of the Army,
Washington 25, D. C.

AUTHORITY

1. This report is submitted in compliance with Section 103 of Public Law 780, 83rd Congress, Chapter 1264, 2nd Session, H. R. 9859, the River and Harbor Act of 1954, approved September 3, 1954 which reads as follows:

> "The Secretary of the Army is hereby authorized and directed to cause preliminary examinations and surveys to be made at the following-named localities, and subject to all applicable provisions of Section 110 of the River and Harbor Act of 1950: ------Vicinity of Wells Beach and Drakes Island, Maine."

The area of study is referred to in this report as Wells Harbor, Maine, the name used for the existing Federal project at the location.

2. A favorable preliminary examination report of the Division Engineer of the New England Division dated December 2, 1955 entitled "Vicinity of Wells Beach and Drakes Island, Maine" was reviewed by the Board of Engineers for Rivers and Harbors. The Board concurred with the recommendation by the Division Engineer that a survey be made. A study of survey scope was authorized by the Chief of Engineers in a letter dated August 27, 1956.

SCOPE OF STUDY

3. The study included a detailed hydrographic survey including soundings and probings of Wells Harbor which is the lower reach and the entrance of the Webhannet River and the location of the proposed improvement. A topographic survey was made of the northern end of Wells Beach and of Drakes Island adjacent to the river entrance. Study was made of available data on the use of existing small boat harbors between Portland, Maine and

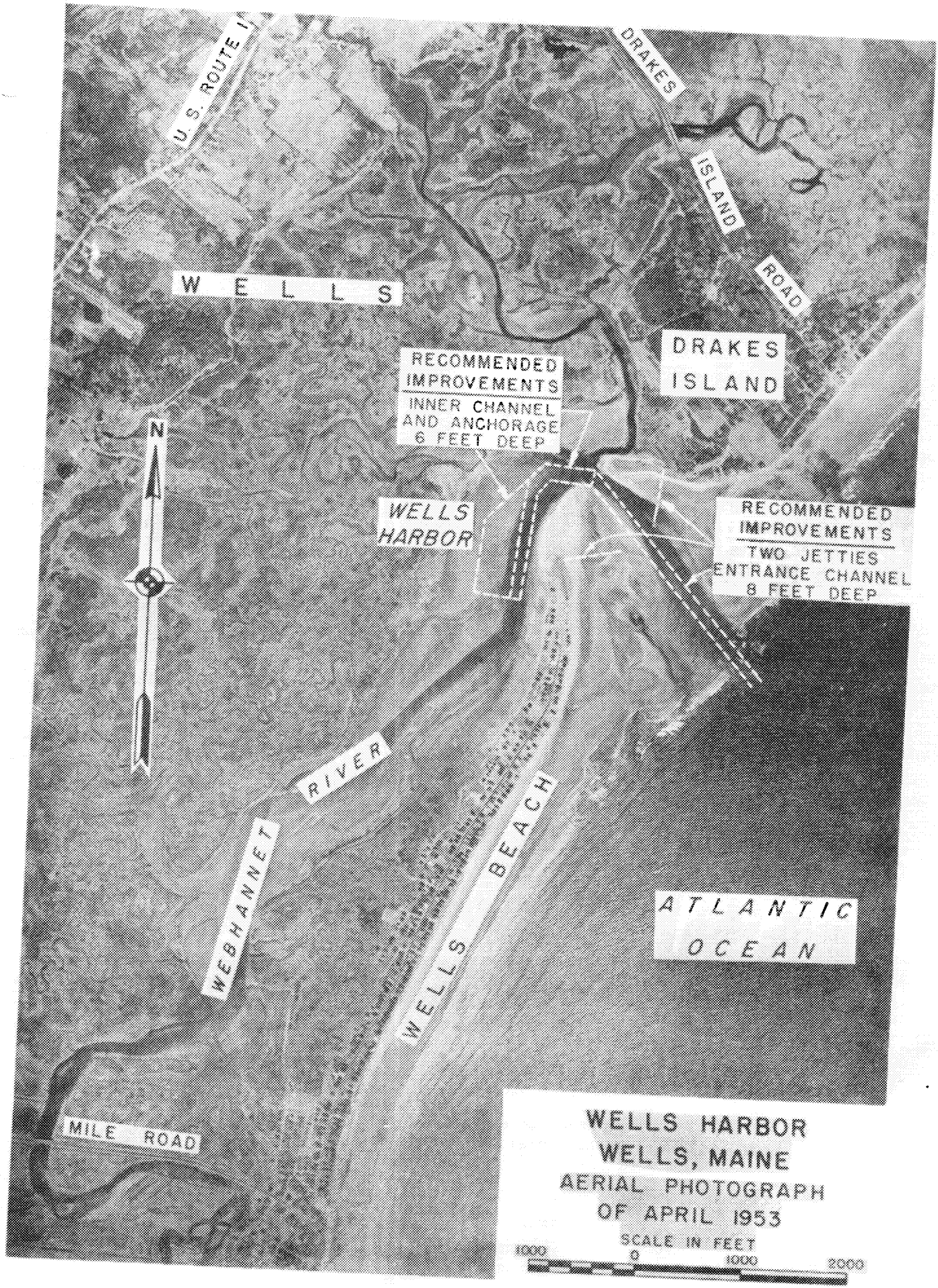
Portsmouth, New Hampshire to determine the general character of present use and the adequacy of present facilities and the need for additional harbor improvements in the area. Information and conclusions from this study are included in this report under Existing and Prospective Commerce. A public hearing was held at Wells, Maine on September 1, 1955 and information obtained there is described under Improvement Desired. Subsequent to the hearing, town officials were contacted in order to bring previously obtained information up to date. Available maps and charts and aerial photographs of the Webhannet River and adjoining shores were studied and detailed field inspections were made to determine the character of shore processes and the probable effect of any improvement on adjacent shores.

DESCRIPTION OF NAVIGATION CONDITIONS

4. Wells Harbor is located in York County in the Town of Wells at the mouth of the Webhannet River about 20 miles northeast of Portsmouth Harbor and about 34 miles southwest of Portland Harbor. The nearest adjacent developed harbors are at Kennebunk River about 4.5 miles to the north and Josias River about 6 miles to the south.

5. The Webhannet River is a shallow winding stream which extends about 4 miles inland from the coast. Its lower 2 miles flows northerly through marsh behind Wells Beach. It empties eastward into the Atlantic Ocean between the north end of Wells Beach and the south end of Drakes Island. Flow is principally tidal. The mean range of tide is 8.7 feet and the spring range is 9.9 feet. The highest tide is estimated as 13.5 feet above and the lowest tide as 3.5 feet below the plane of mean low water. The river entrance faces open water to easterly directions. It is in the lee of the mainland from westerly directions and from the north. Cape Porpoise limits the fetch to the northeast to about 4 miles, Nova Scotia limits it from the northeast to east to about 250 miles and Cape Cod limits it from the south to about 85 miles. There is an unobstructed fetch from the east to the southeast across the Atlantic Ocean but some sheltering effect is afforded from this direction by the shoals on Georges Bank about 135 miles distant. The harbor area behind Wells Beach is well sheltered from all directions, the maximum and only significant fetch of about one mile existing in a south southwest direction along the course of the river from the vicinity of its mouth.

6. According to wind records for the 7-year period October 1949 to September 1956 at Portland, Maine, prevailing winds blow offshore from westerly directions. Onshore winds from easterly directions occurred about one-third of the time and they generally had a higher average speed than westerly winds. Wind speeds of 32 miles per hour and greater occurred with much greater frequency from easterly over westerly directions with approximately 50 percent from the


U.S. ROUTE
DRAKES
ISLAND
ROAD
W E L L S
DRAKES
ISLAND
RECOMMENDED
IMPROVEMENTS
INNER CHANNEL
AND ANCHORAGE
6 FEET DEEP
N
WELLS
HARBOR
RECOMMENDED
IMPROVEMENTS
TWO JETTIES
ENTRANCE CHANNEL
8 FEET DEEP
RIVER
WEBHANNET
WELLS BEACH
ATLANTIC
OCEAN
MILE ROAD
WELLS HARBOR
WELLS, MAINE
AERIAL PHOTOGRAPH
OF APRIL 1953
SCALE IN FEET
1000
0
1000
2000

east and the east northeast. The duration of all easterly winds as well as those 32 miles per hour and over was slightly greater from the northeast over the southeast quadrant. The strongest winds with the longest duration generally blow over the longest fetches. Wave hindcast statistics prepared by the Beach Erosion Board from synoptic weather charts for the three-year period 1948 - 1950 for a location off Penobscot, Maine indicate that the most severe wave attack occurs from the east northeast and east directions. Diagrams showing the direction, speed and duration of winds at Portland and the direction, height and duration of waves off Penobscot Bay are shown on Plate 1. The locality is shown on United States Coast and Geodetic Survey Chart No. 1205 and on Plate 1 of this report.

TRIBUTARY AREA

7. Areas immediately tributary to Wells Harbor and the Webhannet River are Wells Beach and Drakes Island and the development in the town of Wells along United States Highway Route 1 which parallels the shore about one mile inland. Wells Beach and Drakes Island are accessible from U. S. Route 1 over improved roads. Drakes Island is not actually an island but an area of the Town of Wells known locally by that name. The town is served by state highways and by the Boston and Maine Railroad.

8. The Town of Wells is a highly developed summer resort area which in 1950 had a permanent population of 2,321. The principal occupations of the permanent residents are fishing, farming and catering to the needs of summer residents and tourists. The town contains many auto courts, motels, hotels, gift shops and restaurants. There is a large colony of summer cottages at Wells Beach, another at adjacent Moody Beach to the south and a smaller colony at Drakes Island. Hotels and cottages can reportedly accommodate 20,000 to 25,000 people and the summer population increase is conservatively estimated as over 20,000. About 70 percent of the town income is derived from summer industry. Fifty-five (55) percent of the town's evaluated property is owned by non-residents.

BRIDGES AFFECTING NAVIGATION

9. There are no bridges across Wells Harbor or the lower part of the Webhannet River. A fixed highway bridge providing access to Wells Beach from the mainland crosses the Webhannet River about one and one-half miles south or upstream from its mouth. This bridge has limited vertical and horizontal clearances and marks the head of navigation although a few rowboats occasionally moor above the bridge.

PRIOR REPORTS

10. Wells Harbor has been the subject of one prior report of survey scope dated November 2, 1871. It was printed in House

Executive Document No. 34, 42nd Congress, 2nd Session. The report was favorable to the repair of an old existing Government cribwork pier at the harbor entrance for the purpose of straightening and deepening the channel over the bar. The report was unfavorable to improvement of the harbor by dredging.

EXISTING CORPS OF ENGINEERS' PROJECT

11. The existing Federal project for Wells Harbor was adopted in 1872. It provides for repairs to an old government pier about 750 feet long made of cribwork ballasted with stone extending seaward from Drakes Island. Congress appropriated $5,000 for the work by an act dated June 10, 1872. Construction was started in 1872 and completed in 1873 at a cost of $5,000. No work has been done since 1873. At the present time only the piling of the pier remains.

LOCAL COOPERATION ON EXISTING PROJECT

12. No local cooperation was required of local interests on the existing project.

OTHER IMPROVEMENTS

13. Local interests have made no improvements for navigation in the vicinity of Wells Beach and Drakes Island. Private owners have constructed and maintained sea walls for protection of shore property adjacent to the Wells Harbor entrance.

TERMINAL AND TRANSFER FACILITIES

14. There are no terminal, transfer or any other navigational facilities in Wells Harbor or any portion of the Webhannet River. Full utilization of Wells Harbor, if improved, would require the provision and maintenance of moorings and a public landing with suitable supply facilities and utilities.

IMPROVEMENT DESIRED

15. A public hearing was held at Wells, Maine on September 1, 1955 to allow local interests to express their views and present any factual data on improvement of Wells Harbor. The hearing was attended by approximately 145 persons, including representatives of Federal, State and Town governments and local residents.

16. The improvement desired by local interests consists of an entrance channel across the sand bar at the mouth of the harbor and an anchorage in the harbor both of a depth and area to accommodate a potential fishing and recreational fleet. On March 10, 1956 the Wells Town Meeting unanimously passed a resolution agreeing to town participation in the cost of construction

of the improvement which stated in part:

> "that effective upon adoption of and appropriation for the Wells Harbor Project by the Congress of the United States, the Town, if necessary will share in the costs of construction to the extent of the expected benefits to be derived therefrom not exceeding fifty per centum (50%) of the cost thereof, but in no event shall the share of the Town exceed $250,000.00."

17. The Wells Harbor Committee, a group appointed by the town which has been very active in connection with development of a harbor, has stated that mooring space for 300 craft is desirable and, if possible, the harbor should be able to accommodate at least 200 craft. The Committee has expressed its desire for harbor development with a proposed public landing to be located in accordance with the following order of preference:

a. Along the north side of Mile Road, about 7000 feet south of the harbor entrance.

b. Behind Wells Beach on the east side of the harbor.

c. Along the south side of Drakes Island Road about 4000 feet north of the harbor entrance.

18. Proponents of the improvement claim that it will result in benefits from commercial and sports fishing and from local and transient recreational boating. Benefits reportedly will occur from redevelopment of the fishing commerce which the town once enjoyed and also from the provision of a livelihood to a number of individuals from the excellent sport fishing which exists opposite the mouth of the harbor, an area now used for fishing by boats based at adjacent harbors. Benefits will result by provision of needed recreational boating facilities for town residents who have to base their boats at harbors at Ogunquit, Kennebunkport and Cape Porpoise. Benefits will also occur through the acquisition of new boats by residents who have been deterred from buying boats by lack of facilities. In this connection, it was reported that nearby harbors are all overcrowded and generally capable of only limited expansion, that a need exists for facilities for transient craft and that there is a general inadequacy of and need for such facilities for accommodation of transient craft along the entire Maine coast between Portsmouth and Portland.

19. It was reported that two applications have been received for establishment of facilities for the construction, repair, maintenance and storage of boats, if the harbor is improved. Such facilities would provide additional employment and income for the town.

20. It was further stated that the improvement is desirable from the standpoint of safety since the nearest Coast Guard station at present is at Ogunquit, about 5 miles southerly, from which boats have to be called frequently.

21. The town and private individuals have expressed an interest in the use of any available material from the harbor dredging for filling land which could be used for the site of boating facilities and general development or expansion of the beach colony or for restoring eroded beach areas along Wells Beach and protecting the shore front development.

EXISTING AND PROSPECTIVE COMMERCE

22. There is no commercial shipping in Wells Harbor. Navigation is reportedly limited to small local boats at high tide. Town officials obtained information pertaining to prospective use of the harbor by mailing 2,000 questionnaires to townspeople. Replies were received from 147 of which 123 favored and 24 opposed the development. Of these, 45 now own boats most of which are based in Ogunquit, Kennebunkport or Cape Porpoise. The estimated value of the above boats was given as $36,650. It was reported on 77 questionnaires that a boat would be purchased if a suitable harbor was developed. The estimated total value of these boats was given as $77,900. Interest in the formation of a yacht club was reported on 123 questionnaires if a suitable harbor was developed.

23. In addition to the information from the written questionnaire, town officials state that they have learned by word of mouth that if a harbor is developed, there will be an additional need to accommodate craft from surrounding towns which have a tributary population of 100,000 people. No estimate of the number of craft is available, but officials feel that the amount of this traffic will be substantial.

24. There is a general need for additional harbor space for the accommodation of locally based and transient fishing and recreational craft along this section of the Maine coast. This is evident from the present use, recent improvement and prospective improvement of harbors between Portsmouth, New Hampshire and Portland, Maine. In this area there are eight improved small boat harbors for each of which a Federal project exists. They are (1) Richmond Island Harbor, (2) Scarboro River, (3) Saco River, (4) Wood Island Harbor and the Pool at Biddeford, (5) Cape Porpoise Harbor, and (6) Kennebunk River located 23, 23, 16.5, 16, 7, and 4.5 miles respectively to the north of Wells Harbor and (7) York Harbor and (8) Josias River, Ogunquit located 14 and 6 miles respectively to the south. Scarboro River, the Pool at Biddeford, Cape Porpoise Harbor and the Josias River have been enlarged by dredging since 1950. The Josias River, despite its recent improvement, has been found to need additional anchorage area by a Federal

study of survey scope made in 1957. Another Federal study was in progress in 1957 to determine the need for improvement of York Harbor which is reportedly so crowded that boats have to moor in the fairway and in exposed locations. It is reported that crowded conditions in York Harbor make it practically impossible for transient craft to obtain mooring space. The general need for harbor space indicates that if an adequate harbor is developed in the Webhannet River, it will be used by existing fishing and recreational craft which will be transferred from adjacent harbors, by new boats purchased by residents of Wells and surrounding towns or by transient craft which now have difficulty in obtaining accommodations anywhere along this coast.

VESSEL TRAFFIC

25. There is no record of vessel traffic in Wells Harbor. The difficulties attending use of the harbor limits navigation so that for all practical purposes vessel traffic can be considered to be non-existent. A measure of prospective traffic is given by information furnished by townspeople in reply to a questionnaire regarding present ownership and anticipated purchase of boats. There are reportedly 45 boats now owned by townspeople and they are based in adjacent harbors. It is also reported that 77 new boats will be purchased by townspeople if Wells Harbor is improved and that additional traffic by boat owners from surrounding towns will develop. The general need for harbor facilities for transient craft indicates that prospective traffic can reasonably be expected to result from this source. Based on the above, it is estimated that a harbor with a capacity of at least 150 craft will be fully used if it is developed. It is estimated that such a potential fleet will consist of 144 locally based craft and a number of transient vessels, the latter with a combined use of the harbor equivalent to 6 locally based craft. The 144 locally based craft are likely to consist of 3 commercial and 27 recreational boats transferred from adjacent harbors and 11 commercial and 103 recreational boats which will be acquired by towns residents and residents in the surrounding towns. The types, lengths and drafts of the vessels likely to make up the potential fleet as indicated by comparable existing small boat harbor fleets, is shown on the following tabulation:

Potential Fleet

Type	Number Locally Based	Number Transients	Length (Feet)	Draft (Feet)
Recreational				
Outboard	27	-	10-20	1
Inboard	20	-	20-30	1-2
Sailboats	46	1	15-30	2-4
Auxiliary Sailboats	13	3	20-40	2-5
Cruisers	24	2	25-40	2-5
Commercial				
Lobster Boats	14	0	20-40	2-5
TOTAL	144	6		

DIFFICULTIES ATTENDING NAVIGATION

26. A bar at the mouth of the Webhannet River with a controlling depth of approximately 1.5 feet prevents entrance to Wells Harbor except at higher stages of the tide. Within the harbor, the natural channel is narrow and shallow between low sand and marsh flats. There are no facilities of any type for boats which can enter the harbor.

WATER POWER AND SPECIAL SUBJECTS

27. There are no matters of water power or flood control pertinent to this investigation. The desired improvement will probably require the lowering of a 10-inch cast iron water line which crosses the river entrance from Drakes Island to Wells Beach. A Federal permit was issued in 1938 for this line to be laid about 3 feet below the river bottom. Local interests desire, if practicable, to use material to be obtained from dredging of the proposed navigation improvement for filling low areas adjacent to the river or for placement along Wells Beach. The former would create land for accommodation of necessary harbor facilities or for expansion of the present shore development. The latter would provide a fronting protective beach for a portion of Wells Beach which in recent years has experienced damages from erosion and wave attack. Use of the fill for either purpose would result in a benefit to the town or private individuals by land enhancement or prevention of damages to shore property.

PLANS OF IMPROVEMENT

28. General Description. - All improvements desired by local interests were considered. All plans of improvement included two jetties at the harbor entrance 520 and 560 feet long, an entrance channel 100 feet wide and 10 or 8 feet deep, an anchorage within the harbor 8 or 6 feet deep with an area varying from 9.5 to 7.4 acres and an inner channel 100 feet wide and 8 or 6 feet deep to the anchorage and to the vicinity of a proposed public landing to be located preferably at Mile Road, secondly at the east side of the harbor on the landward side of Wells Beach, or thirdly at Drakes Island Road.

29. Basis of Design. - A channel width of 100 feet increased to 150 feet in the sharp bend from the entrance into the harbor was used as the minimum necessary for a safe and easy passage.

30. Depths below the plane of mean low water of 10 feet in the entrance combined with 8 feet in the channel and anchorage within the harbor were considered in accordance with the desires of local interests. Reduced depths of 8 feet in the entrance combined with 6 feet in the channel and anchorage within the harbor were also considered since the latter depth was one foot more than the maximum draft of most of the vessels in the anticipated fleet. An entrance channel depth 2 feet greater than within the harbor was used to allow for pitching and heaving of vessels due to ocean waves and swells in this more exposed area and also to allow for the likelihood that shoaling in the entrance would be more rapid than in the harbor. Overdepth dredging of one foot was estimated in all plans to allow for the inaccuracies of the dredging process.

31. The anchorage having an area of 9.5 acres was based on the expressed desire of local interests for space to accommodate at least 200 vessels. It was estimated that 9.5 acres with fore and aft anchoring on moorings, a method acceptable to the town, would have the desired capacity. The anchorage having an area of 7.4 acres represents space capable of accommodating about 150 vessels similarly anchored. The reduction in area was considered because of the need to reduce the total project cost.

32. The total project cost governed the selection of the finally selected project depths and the location and size of the anchorage. This was due to a resolution passed by the Town of Wells limiting the amount of their participation to not more than $250,000. It was found necessary in order to remain within the above figure to select an 8-foot entrance channel and a 6-foot channel and 7.4-acre anchorage inside the harbor behind Wells Beach. The anchorage was located as close as possible to the entrance in order to reduce the required amount of dredging by shortening the length of channel needed to reach it.

33. The channels and anchorage were laid out so as to take advantage of as much naturally deep water as possible without introducing any unnecessary bends in the channel which might make navigation more

difficult. The anchorage was located on the west side of the harbor channel in order to permit free movement of vessels to the proposed public landing to be located on the east or opposite side.

34. Due to the existence of valuable clam beds in the marshes bordering the west side of the harbor which the Town of Wells did not want to disturb, no consideration was given to location of a public landing, channel or anchorage in that area.

35. The proposed jetties at the harbor entrance were designed (1) to reduce shoaling by intercepting and impounding littoral drift which would likely move towards and into the harbor from the sandy shores of Wells Beach to the south and Drakes Island to the east and north, (2) to fix the location and maintain the depth of the entrance channel by directing and controlling the inlet currents and (3) to provide shelter from ocean waves and swells for vessels passing through the inlet and for those vessels moored in the northern portion of the anchorage.

36. Stone construction for the jetties was selected as the type which would be most economical to build and maintain. A top width of 5 feet was selected as the minimum in which riprap of adequate size could be used. Side slopes and size of cap and slope stones were based on the modified Iribarren formula using the maximum waves that could be supported by depths existing at the site when the tide level was 12 feet above the plane of mean low water, a level which according to tide records at Portland, Maine will probably occur about once a year. The wave height was estimated as equal to the depth divided by 1.28, a theoretical relationship derived from analysis of a so-called solitary wave.

37. An inshore elevation of jetties of 15 feet above mean low water was used as necessary to impound drifting sand without excessive overtopping. A lower top elevation of the outer portions of the jetties of 13 feet was used to reduce the required quantity of stone and the cost of construction. Lowering of the top of the jetties below a 13-foot elevation was considered and rejected because overtopping by waves and swells would reduce their visibility and, therefore, be objectionable to mariners, and would also reduce their sheltering effect.

38. A 400-foot opening between the jetties was used to provide width for a safe and easy passage and to provide an opening with hydraulic characteristics similar to those existing in the natural opening between Wells Beach and Drakes Island. The natural opening appears to have had the favorable effect of scouring and maintaining a channel of desirable dimensions.

39. The jetties were oriented perpendicular to the shore, the most effective direction to impound littoral drift. The inshore end of the jetty from Wells Beach was located at the downdrift end of the beach development to eliminate the possibility of any harmful effects

from interception of material normally nourishing the beach fronting the developed area. It was located at the north end of an existing concrete seawall and the north end of the high portion of the backshore to permit its being properly anchored to prevent flanking. The inshore end of the jetty from Drakes Island was established by the location of the Wells Beach jetty at a point where it could be properly anchored into existing sand dunes downdrift from the beach development.

40. Shoreline Changes. - The proposed improvement is expected to result in gradual accretion from the impounding of littoral drift along the shores adjacent to the proposed jetties extending for distances probably not exceeding 1,000 feet south along Wells Beach and 1,000 feet east and north along Drakes Island. There will also be accretion along about 1,300 feet of shore adjacent to and south of the jetty at Wells Beach from the proposed placement of a protective beach using fill obtained from dredging the entrance channel. Accretion will also result along the shore of the harbor side of Wells Beach from direct placement of dredged material to reclaim land for a public landing and attendant facilities. The proposed improvement is not expected to have any effects on adjacent shores other than those from impounding of littoral drift and placement of dredged material generally as described above.

41. Required Aids to Navigation. - The United States Coast Guard has been consulted in regard to the establishing of suitable aids to navigation for the finally selected plan of improvement involving construction of two jetties, an 8-foot entrance channel and a 6-foot anchorage and channel within the harbor terminating behind the northern end of Wells Beach. Information furnished indicates that one (1) can and one (1) nun buoy having a total estimated first cost of about $1,000 and a total estimated annual maintenance cost of about $100 will be required.

ESTIMATES OF FIRST COSTS

42. Estimates of first costs have been made for all plans considered, based on prices prevailing in August 1957. Only one plan involving construction of two (2) jetties at the harbor entrance, dredging an 8-foot entrance channel, a 6-foot anchorage of 7.4 acres and a 6-foot inner channel terminating behind the northern end of Wells Beach satisfied the town-imposed condition limiting the local cash contribution to $250,000. All other plans would require a larger cash contribution so a complete economic analysis involving them has not been made. In addition to the satisfactory plan, estimates of costs are included below for information and comparison only, on the plans in which the channels terminate in the vicinity of Mile Road and also at Drakes Island Road.

43. Plan with Channel Terminating Behind North End of Wells Beach (Only Suitable Plan).

Project Construction

Construction of 2 jetties, 9,500 tons stone @ $8.00	$ 76,000
Dredging 8-foot entrance channel, 6-foot 7.4 acre anchorage and a 6-foot inner channel, 234,000 cu. yds. @ $1.25	292,500
	368,500
Contingencies	55,500
Engineering and Design	13,000
Supervision and Administration	32,000
Total Project Construction Cost	469,000
Aids to Navigation	1,000
Public landing and attendant facilities	25,000
Total Cost	$495,000

44. Plans with Channel Terminating Near Mile Road. -

a. 10-Foot Entrance and 8-Foot Inner Harbor Depths. -

Project Construction

Construction of 2 jetties, 9,500 tons stone @ $8.00	$ 76,000
Dredging 10-foot entrance channel, 8-foot, 9.5 acre anchorage and 8-foot inner channel, 633,000 cu. yds. @ $1.00	633,000
	709,000
Contingencies	106,000
Engineering and Design	24,000
Supervision and Administration	60,000
Total Project Construction Cost	899,000
Aids to Navigation	1,000
Public landing and attendant facilities	25,000
Total Cost	$925,000

b. 8-Foot Entrance and 6-Foot Inner Harbor Depths. -

Project Construction

Construction of 2 jetties, 9,500 tons stone @ $8.00	$ 76,000
Dredging 8-foot entrance channel, 6-foot, 9.5 acre anchorage and 6-foot inner channel, 478,000 cu. yds. @ $1.05	501,900
	577,900
Contingencies	86,100
Engineering and Design	20,000
Supervision and Administration	50,000
Total Project Construction Cost	734,000
Aids to Navigation	1,000
Public landing and attendant facilities	25,000
Total Cost	$760,000

45. Plans with Channel Terminating Near Drakes Island Road. -

a. 10-Foot Entrance and 8-Foot Inner Harbor Depths. -

Project Construction

Construction of 2 jetties, 9,500 tons stone @ $8.00	$ 76,000
Dredging 10-foot entrance channel, 8-foot, 9.5 acre anchorage and 8-foot inner channel, 443,000 cu. yds. @ $1.05	465,150
	541,150
Contingencies	80,850
Engineering and Design	18,000
Supervision and Administration	49,000
Total Project Construction Cost	689,000
Aids to Navigation	1,000
Public landing and attendant facilities	25,000
Total Cost	$715,000

b. 8-Foot Entrance and 6-Foot Inner Harbor Depths. -

Project Construction

Construction of 2 jetties, 9,500 tons stone @ $8.00	$ 76,000
Dredging 8-foot entrance channel, 6-foot, 9.5 acre anchorage and 6-foot inner channel, 338,000 cu. yds. @ $1.20	405,600
	481,600
Contingencies	71,400
Engineering and Design	17,000
Supervision and Administration	39,000
Total Project Construction Cost	609,000
Aids to Navigation	1,000
Public landing and attendant facilities	25,000
Total Cost	$635,000

ESTIMATES OF ANNUAL CHARGES

46. The estimated annual charges have been computed using an assumed project life of 50 years and an interest rate of 2.5 percent. The annual charges have been computed on the basis that local interests will contribute in cash a portion of the cost of the improvement and will provide a suitable public landing and attendant facilities. The total cost to local interests has been computed in a subsequent section of this report under Apportionment of Costs Among Interests. It has been determined to be approximately 46 percent of the estimated total project construction cost plus the entire cost of constructing and maintaining

a public landing which share of the cost is commensurate with that portion of the benefits which are local in nature. Annual charges have been computed only for the plan of improvement involving construction of two (2) jetties at the harbor entrance, the dredging of an 8-foot entrance channel, a 6-foot, 7.4 acre anchorage and a 6-foot inner channel terminating behind the north end of Wells Beach.

ESTIMATED FIRST COSTS

Federal	
Construction cost; Corps of Engineers	$253,000
Navigation Aids, Coast Guard	1,000
Total Federal Cost	$254,000
Non-Federal	
Construction cost; Local interests	$216,000
Public landing and attendant facilities: Local interests	25,000
Total Non-Federal Cost	$241,000
Total First Costs	$495,000

ESTIMATED ANNUAL CHARGES

Federal	
Corps of Engineers	
Interest	$ 6,320
Amortization	2,600
Maintenance	
Dredging 3,000 cu. yds. @ $1.50	4,500
Jetties, 95 tons stone @ $10.	950
Coast Guard	
Interest	20
Amortization	10
Maintenance	100
Total Federal Annual Charges	$ 14,500
Non-Federal	
Interest	
Project construction	$ 5,400
Public landing and attendant facilities	620
Amortization	
Project construction	2,220
Public landing and attendant facilities	260
Maintenance	
Public landing and attendant facilities	1,000
Total Non-Federal Annual Charges	$ 9,500
Total Annual Charges	$ 24,000

ESTIMATES OF BENEFITS

47. General. - Benefits have been estimated for the improvement of Wells Harbor for a potential fleet of 150 recreational and commercial fishing craft by construction of 2 jetties at the entrance, dredging of an 8-foot entrance channel and a 6-foot channel and anchorage within the harbor terminating behind the north end of Wells Beach. Land enhancement benefits have been estimated on the use of material obtained from the dredging for filling land for development of boating facilities and expansion of the present shore development. Benefits have also been estimated from placement of dredged fill along Wells Beach to provide protection for the existing shore development.

48. Recreational Benefits. - Recreational benefits have been estimated on 130 locally based and a number of transient recreational craft, the latter having a combined use of the harbor equivalent to 6 locally based boats during an entire season. Benefits for the locally based craft are based on a fleet composed of 27 existing boats transferred from adjacent harbors and 103 new boats acquired by residents of Wells and surrounding towns as a result of the improvement. Benefits are based on an annual net return to the owners taken as the amount the owners would receive if the boats were let out on a for-hire basis. This amount is computed as a percentage return on the average depreciated value of the boats equal to one-half of the average value when new. For transferred locally based boats, the benefit will result from an increase in the annual net return due to the boats being based closer to the place of residence of the owners. This increase is estimated as 20 percent of the total possible net return. For the new locally based and the transient craft the benefit is estimated as 100 percent of the total possible net return reduced in the case of the locally based boats for the time they are away from the harbor on cruise. The computed benefits are shown in the following tabulations: Annual benefits amount to $770 (850-80) for locally based recreational craft transferred from other harbors, $14,500 (15,960-1,460) for locally based new recreational craft and $1,800 for transient recreational craft.

BENEFITS TO LOCALLY BASED RECREATIONAL CRAFT TRANSFERRED FROM OTHER HARBORS

Type of Craft	Length (Feet)	Number	Depreciated Value ($) Average	Depreciated Value ($) Total	Percent Return Ideal	Present	Future	Gain	Value of Return ($)	On Cruise No. Days Average	On Cruise % of Season	On Cruise Value ($)
Outboards	10-20	5	$ 500	$ 2,500	11	8.8	11	2.2	$ 60	-	-	-
Inboards	20-30	4	1,400	5,600	9	7.2	9	1.8	100	-	-	-
Sailboats	15-30	10	1,000	10,000	9	7.2	9	1.8	180	10	8.3	15
Auxiliary Sailboats	20-40	2	5,300	10,600	7	5.6	7	1.4	150	15	12.5	20
Cruisers	25-40	6	4,300	25,800	7	5.6	7	1.4	360	15	12.5	45
TOTALS	-	27	-	$54,500	-	-	-	-	$850	-	-	$80

BENEFITS TO LOCALLY BASED NEW RECREATIONAL CRAFT

Type of Craft	Length (Feet)	Number	Depreciated Value ($) Average	Depreciated Value ($) Total	Percent Return Ideal	Present	Future	Gain	Value of Return ($)	On Cruise No. Days Average	On Cruise % of Season	On Cruise Value ($)
Outboards	10-20	22	$ 500	$11,000	11	0	11	11	$ 1,210	-	-	-
Inboards	20-30	16	1,400	22,400	9	0	9	9	2,010	-	-	-
Sailboats	15-30	36	1,000	36,000	9	0	9	9	3,240	10	8.3	$ 270
Auxiliary Sailboats	20-40	11	5,300	58,300	7	0	7	7	4,080	15	12.5	510
Cruisers	25-40	18	4,300	77,400	7	0	7	7	5,420	15	12.5	680
TOTALS	-	103	-	$205,100	-	-	-	-	$15,960	-	-	$1,460

BENEFITS TO TRANSIENT RECREATIONAL CRAFT

Type of Craft	Length (Feet)	Craft Presently Visiting	Proposed Visitors			
			Average Depreciated Value	Boat Days	Percent Return	Value of Return
Sailboats	15-30	None	$1,000	120	9	$ 90
Auxiliary Sailboats	20-40	None	5,300	360	7	1,110
Cruisers	25-40	None	4,300	240	7	600
TOTALS	-	-	-	-	-	$1,800

49. Commercial Fishing Benefits. - Benefits have been estimated on 14 locally based fishing boats engaged in lobstering, 3 of the boats transferred from adjacent harbors and 11 newly acquired. The estimate is based on year round use of 1 of the transferred boats and 5 of the new boats, the others being used part time. The annual lobster catch for each of the full time boats is estimated as 8,000 pounds and that for each of the part time boats as 2,000 pounds. The benefit from the transferred boats is based on a 20 percent increase in production due to a saving in travel time resulting from location of the boats closer to the residence of the owners. The benefit from the new boats is based on the entire estimated catch. This benefit is computed as the net return to the lobstermen equal to 40 percent of the selling price of the lobsters. The average selling price per pound of lobsters according to State of Maine statistics is $0.38 per pound. The annual benefit computed in the following tabulation amounts to $8,260.

BENEFIT FROM LOBSTER FISHING BOATS

Type	Number	Usage	Estimated Annual Catch (Pounds)		Increased Catch		Benefit (40% x $0.38/ pound)
			Annual Rate	Total	Percent	Pounds	
Transferred	1	Full time	8,000	8,000	20	1,600	$ 240
Transferred	2	Part time	2,000	4,000	20	800	120
New	5	Full time	8,000	40,000	100	40,000	6,080
New	6	Part time	2,000	12,000	100	12,000	1,820
TOTALS	14			64,000		54,400	$ 8,260

50. Shore Protection Benefits. - Placement of material dredged from the proposed improvement to form a wider beach south of and adjacent to the proposed south jetty will protect approximately 1,300 feet of cottage development along Wells Beach, which is now subject to wave attack and damages due to the narrowness of the fronting beach. Benefit will be derived from prevention of direct damages and reduction of maintenance costs of existing protective structures having a value estimated as about $40,000. It is estimated that the annual benefit will amount to at least $1,000 per year.

51. Land Enhancement Benefits. - Local interests propose to use material available from the dredging of the navigation improvement to create land behind Wells Beach for a public landing, attendant facilities and general development of the beach colony. Approximately 200,000 cubic yards of material will be available and it can create about 12 acres of new land having an estimated value of $4,000 an acre. The benefit therefrom is computed below:

Total estimated value of new land $4,000 x 12	$48,000
Estimated cost of diking above that required for a public landing	15,000
Net value of new land	33,000
Estimated annual return or benefit 10% of $33,000	3,300

52. Classification of Benefits. - All benefits have been classified as general or local in nature. Recreational small boat benefits have been classified as 50 percent general and 50 percent local. Benefits from lobster boats which are commercial have been classified as 100 percent general. Shore protection and land enhancement benefits have been classified as 100 percent local. The percentage of local benefits to total benefits has been determined for use as a basis for computing the share of the total cost of the project to be borne by local interests.

Source of Benefit	Classifications		Total
	General	Local	
Recreational craft transferred from other harbors, locally based	$ 385	$ 385	$ 770
New recreational craft, locally based.	7,250	7,250	14,500
Transient recreational craft	900	900	1,800
Lobster fishing boats	8,260	0	8,260
Shore protection	0	1,000	1,000
Land enhancement	0	3,300	3,300
Total	$16,795	$12,835	$29,630
Percentage of Total	56.7	43.3	100.0

COMPARISON OF BENEFITS TO COSTS

53. The estimated annual benefits and annual costs and ratio of benefits to costs for the plan of improvement involving construction of two (2) jetties at the harbor entrance dredging an 8-foot entrance channel, a 6-foot, 7.4 acre anchorage and a 6-foot inner channel terminating behind the north end of Wells Beach are as follows:

Estimated annual benefits	$29,630
Estimated annual costs	24,000
Ratio of benefits to costs	1.2

PROPOSED LOCAL COOPERATION

54. The benefits to be derived from the proposed improvement are part general and part local in nature. It is considered that local interests should be required to bear a share of the total project costs in proportion to the percentage of local benefits involved. The apportionment of costs between the United States and local interests based on the percentage of local benefits applied to annual charges requires that local interests make a cash contribution of 46 percent of the cost of the proposed construction of the jetties and dredging of the channels and anchorage and bear the entire cost of construction and maintenance of a public landing and attendant facilities. The local cash contribution is presently estimated at $216,000.

55. Local interests should also be required to (a) provide without cost to the United States all necessary lands, easements, and rights-of-way for the construction and maintenance of the project when and as required; (b) hold and save the United States free from property damages that may result from the construction and maintenance of the project; (c) provide and maintain without cost to the United States necessary mooring facilities and utilities including a public landing with suitable supply facilities open to all on equal terms; (d) provide without cost to the United States suitable spoil disposal areas and bulkhead those parts that lie below mean high water and; (e) agree to regulate the use, growth and free development of the harbor facilities with the understanding that said facilities will be open to all on equal terms.

APPORTIONMENT OF COSTS AMONG INTERESTS

56. The apportionment of costs has been computed so that local interests bear a portion of the improvement cost commensurate with the local benefits to be derived. The apportionment has been made between the United States and local interests so that the Federal and non-Federal annual charges bear approximately the same ratio as evaluated general and local benefits. The computation for the apportionment of costs for the proposed project involving construction of two (2) jetties at the harbor entrance, dredging an

8-foot entrance channel, a 6-foot, 7.4 acre anchorage and a 6-foot inner channel terminating behind the north end of Wells Beach is as follows:

Division of Evaluated Annual Benefits

Type	Amount	Percent of Total
General	$16,795	56.7
Local	12,835	43.3
	$29,630	100.0

Division of Annual Charges

Type	Amount	Percent of Total
Federal	$13,610	56.7
Non-Federal	10,390	43.3
	$24,000	100.0

Apportioned First Costs:

Federal:

Construction cost of jetties and dredging	$469,000		
Less local cash contribution (computed below)	216,000		
Corps of Engineers cost		$253,000	
Coast Guard cost		1,000	
Total Federal cost			$254,000

Non-Federal:

Public landing and attendant facilities		25,000	
Cash contribution * $\frac{10,390-1880}{0.03526} - 25,000$		216,000	
Total Non-Federal cost			$241,000
Total Project cost			$495,000

* The cash contribution equals the non-Federal share of the annual charges ($10,390) less the annual maintenance cost of the public landing ($1,000) and the annual interest and amortization cost on the public landing ($880)

all divided by the combined interest and amortization rate (0.025 + .01026), the derived quotient then reduced by the first cost of the public landing and attendant facilities ($25,000).

57. The computed local cash contribution ($216,000) represents approximately 46 percent of the estimated construction cost of the proposed jetties and dredging ($469,000). Therefore, local interests should contribute 46 percent of the project construction cost. A detailed breakdown of the Federal and non-Federal annual charges based on the above apportionment of first costs is included in a preceding section of this report under Estimates of Annual Charges.

COORDINATION WITH OTHER AGENCIES

58. All Federal, State and local agencies known to have an interest in the development and use of waterways were notified of the public hearing on the proposed improvement held at Wells, Maine on September 1, 1955. A representative of the Main Department of Industry and Commerce attended the hearing as well as officials of the town of Wells and members of the Wells Harbor Committee. All agencies which expressed an opinion were in favor of the proposed improvement. During the study two meetings were held with the Wells Town Manager and the Wells Harbor Committee to discuss the detailed plan of improvement. The plan proposed in this report conforms with the desires of the town officials expressed at the above meetings. The Town of Wells and the Maine Public Utilities Commission, the official agency representing the State of Maine, were advised of the final plan for the proposed improvement and their comments were requested particularly in regard to their ability and willingness to assume the required conditions of local cooperation. The Town of Wells represented by the Board of Selectmen, the Wells Harbor Committee and the Town Planning Board reviewed all plans considered in this study and reacted very favorably to the final plan proposed. The Town of Wells and the Maine Public Utilities Commission indicated that all the required conditions of local cooperation can and will be assumed when required. The United States Coast Guard and the United States Fish and Wildlife Service were also advised and requested to comment on aspects of the final plan proposed pertaining to their interests. The United States Coast Guard furnished estimates of first cost and maintenance for required navigation aids. The United States Fish and Wildlife Service did not raise any objection to the proposed plan insofar as it affected their interests.

CONCLUSIONS

59. The Division Engineer finds that improvement of Wells Harbor, Maine is needed for a potential fleet composed of existing and anticipated new recreational craft and lobster fishing boats. It is concluded that the improvement should consist of construction of two stone jetties at the harbor entrance 520 and 560 feet long providing an opening between them 400 feet wide, dredging an entrance channel

100 feet wide and 8 feet deep, and a 7.4 acre anchorage and 100-foot wide inner channel, both 6 feet deep and terminating behind the north end of Wells Beach. The benefit cost ratio is 1.2. The total estimated first cost of construction, exclusive of navigation aids and public landing with attendant facilities, is $469,000.

60. A local cash contribution of 46 percent of the cost of construction should be required in view of the percentage of local benefits to be derived from the project. The presently estimated local cash contribution is $216,000. The share of the first cost of construction, to be borne by the United States, is estimated as $253,000. Funds for construction of the entire project should be appropriated in one fiscal year or funds for construction of both jetties in their entirety ($53,000) or for all the dredging ($200,000) should be appropriated in successive fiscal years in order to assure economical prosecution of these separable portions of the project. The construction of the jetties should be initiated prior to the dredging so that the south jetty can impound material dredged from the entrance channel which may be disposed of along Wells Beach.

61. Since there are no existing terminal facilities, local interests should be required to furnish, without cost to the United States, an adequate public landing with suitable supply facilities open to all on equal terms. The estimated cost of the public landing is $25,000.

62. Other improvements, more desirable to local interests, consisting of a larger anchorage and a channel terminating in the vicinity of Mile Road have been considered and found to be more costly. Such improvements would require a larger local cash contribution than could reasonably be expected at this time.

RECOMMENDATION

63. It is recommended that the existing project for Wells Harbor be modified to provide for the following, all as shown on Plate 1:

(a) Two sand-tight stone jetties with a 400-foot opening, one 520 feet long extending easterly from Wells Beach, the other 560 feet long extending southerly from Drakes Island, both with a top width of 5 feet, a top elevation varying from 15 to 13 feet above mean low water and side slopes varying from 1 on 1.5 to 1 on 2.

(b) An entrance channel 100 feet wide and 8 feet deep at mean low water from deep water in the Atlantic Ocean to the first bend into the harbor.

(c) An inner channel, 100 feet wide, widened to 150 feet in the bend, 6 feet deep at mean low water, terminating behind the north end of Wells Beach.

(d) An anchorage of 7.4 acres, 6 feet deep, located behind the north end of Wells Beach.

64. The total estimated cost of the above work is $469,000, to be borne jointly by the United States and local interests. The estimated cost to be borne by the United States is $253,000 with $5,450 annually for maintenance exclusive of aids to navigation.

65. Modification of the project is recommended subject to the conditions that local interests:

(a) Make a cash contribution of 46 percent of the initial construction cost. The present estimated amount of the contribution is $216,000.

(b) Provide without cost to the United States all necessary lands, easements and rights-of-way for the construction and maintenance of the project when and as required.

(c) Hold and save the United States free from property damages that may result from the construction and maintenance of the project.

(d) Provide and maintain without cost to the United States necessary mooring facilities and utilities including a public landing with suitable supply facilities open to all on equal terms.

(e) Provide without cost to the United States suitable spoil disposal areas and bulkhead those parts that lie below mean high water.

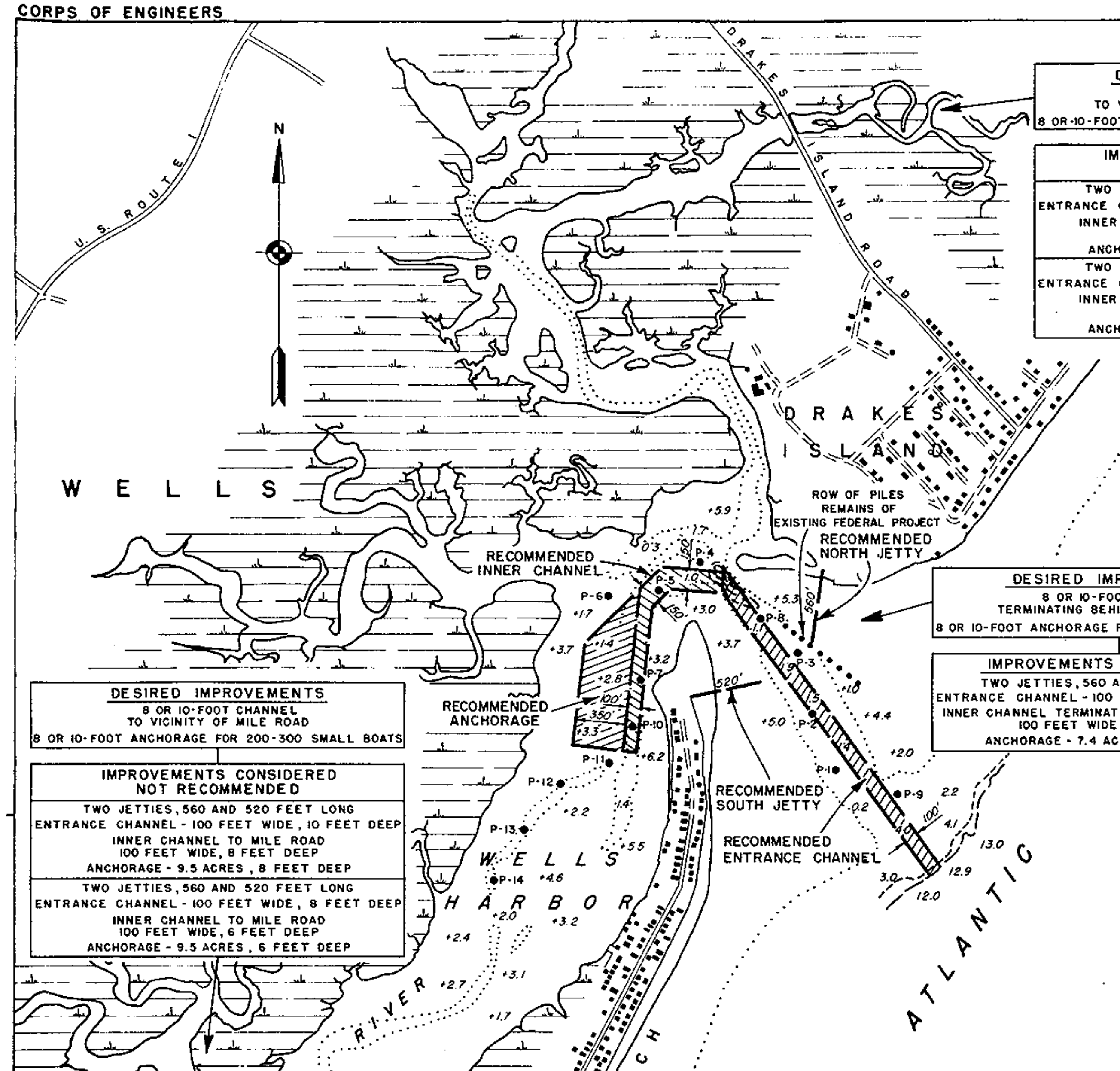
(f) Agree to regulate the use, growth, and free development of the harbor facilities with the understanding that said facilities will be open to all on equal terms.

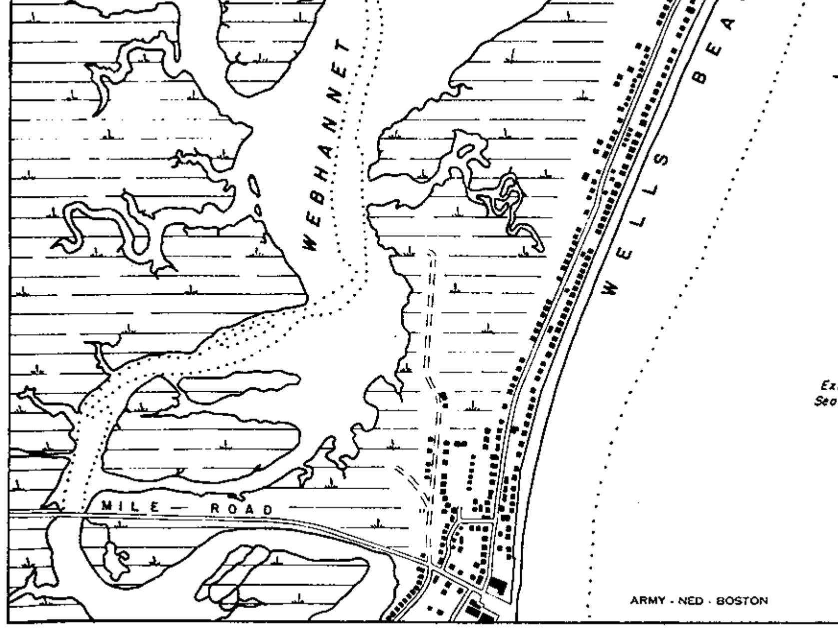
Incl:
Map

ALDEN K. SIBLEY
Brigadier General, U. S. Army
Division Engineer

CORPS OF ENGINEERS

U. S. ARMY





DESIRED IMPROVEMENTS

8 OR 10-FOOT CHANNEL
TO VICINITY OF DRAKES ISLAND ROAD

8 OR 10-FOOT ANCHORAGE FOR 200-300 SMALL BOATS

IMPROVEMENTS CONSIDERED NOT RECOMMENDED

TWO JETTIES, 560 AND 520 FEET LONG
ENTRANCE CHANNEL - 100 FEET WIDE, 10 FEET DEEP
INNER CHANNEL TO DRAKES ISLAND ROAD
100 FEET WIDE, 8 FEET DEEP
ANCHORAGE - 9.5 ACRES, 8 FEET DEEP

TWO JETTIES, 560 AND 520 FEET LONG
ENTRANCE CHANNEL - 100 FEET WIDE, 8 FEET DEEP
INNER CHANNEL TO DRAKES ISLAND ROAD
100 FEET WIDE, 6 FEET DEEP
ANCHORAGE - 9.5 ACRES, 6 FEET DEEP

DESIRED IMPROVEMENTS

8 OR 10-FOOT CHANNEL
TERMINATING BEHIND WELLS BEACH

8 OR 10-FOOT ANCHORAGE FOR 200-300 SMALL BOATS

IMPROVEMENTS RECOMMENDED

TWO JETTIES, 560 AND 520 FEET LONG
ENTRANCE CHANNEL - 100 FEET WIDE, 8 FEET DEEP
INNER CHANNEL TERMINATING BEHIND WELLS BEACH
100 FEET WIDE, 6 FEET DEEP
ANCHORAGE - 7.4 ACRES, 6 FEET DEEP

DESIRED IMPROVEMENTS

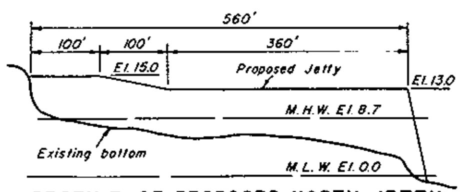
8 OR 10-FOOT CHANNEL
TO VICINITY OF MILE ROAD

8 OR 10-FOOT ANCHORAGE FOR 200-300 SMALL BOATS

IMPROVEMENTS CONSIDERED NOT RECOMMENDED

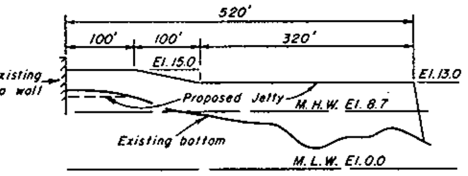
TWO JETTIES, 560 AND 520 FEET LONG
ENTRANCE CHANNEL - 100 FEET WIDE, 10 FEET DEEP
INNER CHANNEL TO MILE ROAD
100 FEET WIDE, 8 FEET DEEP
ANCHORAGE - 9.5 ACRES, 8 FEET DEEP

TWO JETTIES, 560 AND 520 FEET LONG
ENTRANCE CHANNEL - 100 FEET WIDE, 8 FEET DEEP
INNER CHANNEL TO MILE ROAD
100 FEET WIDE, 6 FEET DEEP
ANCHORAGE - 9.5 ACRES, 6 FEET DEEP



PROFILE OF PROPOSED NORTH JETTY
AT DRAKES ISLAND

SCALE IN FEET
HOR. 100 0 100 200
VER. 10 0 10 20



PROFILE OF PROPOSED SOUTH JETTY
AT WELLS BEACH

SCALE IN FEET
HOR. 100 0 100 200
VER. 10 0 10 20

NORTH JETTY DETAILS

CROSS SECTION
Top width 5'
Side slopes 1 on 1.5, inner 460'
1 on 2.0, outer 100'

STONE SIZES
Cap and slopes
1 ton minimum, inner 460'
3 ton minimum, outer 100'

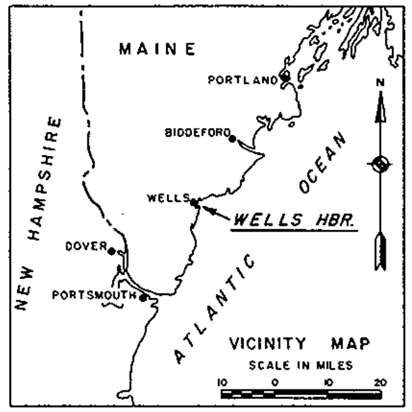
Core
Quarry run of assorted sizes to form a sand-tight core.

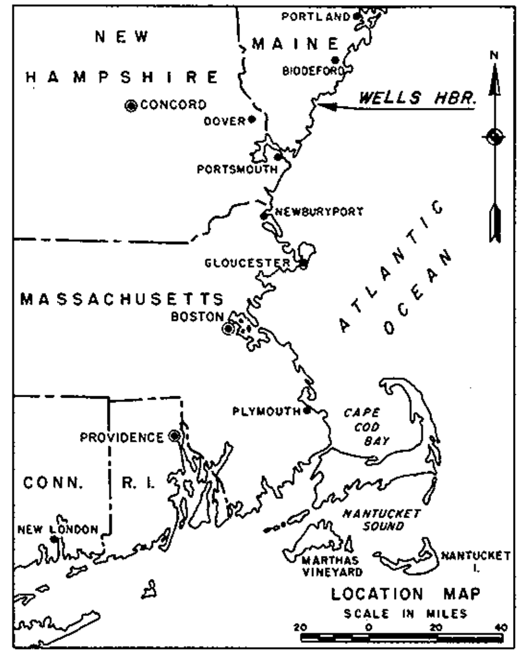
SOUTH JETTY DETAILS

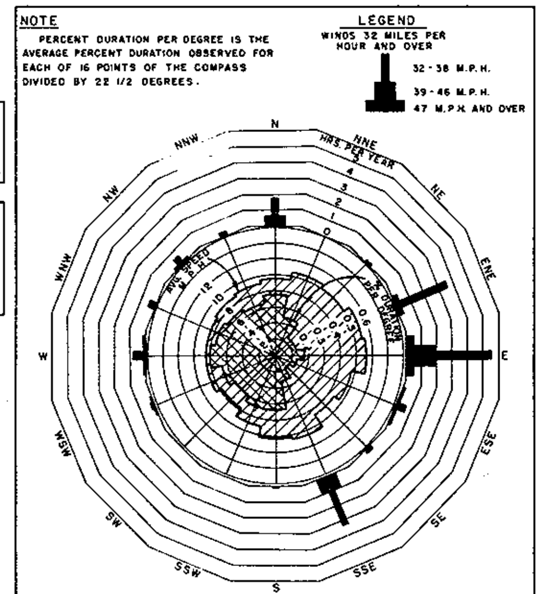
CROSS SECTION
Top width 5'
Side slopes 1 on 1.5, inner 340'
1 on 2.0, outer 180'

STONE SIZES
Cap and slopes
1 ton minimum, inner 340'
3 ton minimum, outer 180'

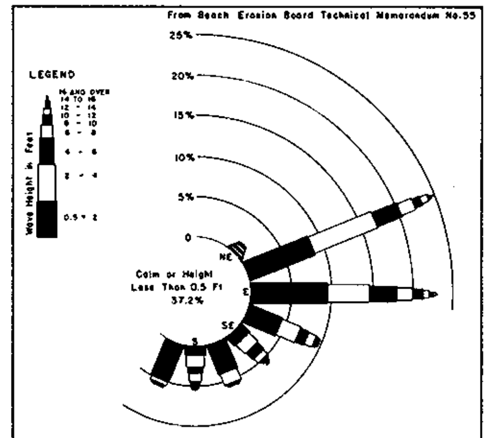
Core
Quarry run of assorted sizes to form a sand tight core.







WIND DIAGRAM
PORTLAND, MAINE
OCTOBER 1949 - SEPTEMBER 1956, INCLUSIVE
BASED ON HOURLY OBSERVATIONS BY THE
U.S. WEATHER BUREAU AT CITY AIRPORT



WAVE DIAGRAM - OFF PENOBSCOT BAY
(LAT. 43°-50' N, LONG. 68°-00' W)
SHOWING PERCENT OF TIME WAVES OF
DIFFERENT HEIGHT OCCUR FROM EACH DIRECTION
HINDCAST FROM SYNOPTIC WEATHER CHARTS
FOR THREE YEAR PERIOD 1948 - 1950

LIST OF PROBINGS

NUMBER	ELEVATION BELOW M.L.W. DEPTH OF WATER	DEPTH OF PROBE	PENETRATION	MATERIAL
1	1.4	1.9	0.5	Loose sand to hard packed sand
2	1.3	2.6	1.3	" " " " " "
3	1.7	3.8	2.1	" " " " " "
4	0.7	8.0	7.3	Sand to hard packed sand
5	+0.8	2.1	2.9	" " " " "
6	+0.9	1.7	2.6	" " " " "
7	2.1	2.8	0.7	Sand & gravel to hard packed sand
8	4.0	7.0	3.0	Sand to hard
9	1.7	2.4	0.7	" " "
10	1.9	2.6	0.7	Gravel & sand to hard
11	+0.8	2.1	2.9	Sand to hard
12	0.9	10.0	9.1	Sand
13	1.3	10.1	8.8	"
14	0.6	8.0	7.4	Mud & sand - sticky

Probings taken from a skiff using a 3/4" pointed pipe forced down by two men.

NOTES

Soundings and probings are in feet and tenths and are referred to the plane of Mean Low Water.

Hydrography, probings, and topography adjacent to the harbor entrance from survey of Feb. 15 - April 22, 1957 by E. J. Colvin. Other topography from U.S.C.&G.S. Shoreline Manuscripts T-11162 and T-11164 based on 1953 aerial photography and inspection.

Contours shown thus:
Low water line . . . .
6-foot depth — - — - —
8-foot depth —— - ——

Probings shown thus: P-14 ●

WELLS HARBOR
WELLS, MAINE

IN 1 SHEET

SCALE IN FEET
500 0 500 1000 1500

NEW ENGLAND DIVISION, BOSTON, MASS. SEPTEMBER 1957

APPROVED: ENGINEERING DIVISION
SUBMITTED: ... REPORTS BRANCH
APPROVED: LT. COL. C.E. Asst. DIVISION ENGINEER

TO ACCOMPANY SURVEY REPORT DATED SEPTEMBER 19, 1957

FILE NO. 1351 D-3-4

PLATE 1